CanadianSolar

Solar Module Installation Manual (IEC)

www.canadiansolar.com

1.0 GENERAL INFORMATION

This general manual provides important safety information relating to the installation, maintenance and handling of CS-series solar modules. System users and professional installers should read this manual carefully and strictly follow the instructions in the manual. Failure to follow these instructions may result in death, injury or property damage. The installation of solar modules requires specialized skills and should only be performed by licensed professionals.
The word "module" or "PV module" used in this manual refers to one or more CS-Series Solar Modules.
Please retain this manual for future reference.

1.1 DISCLAIMER OF INSTALLATION MANUAL

The information contained in this manual is subject to change by Canadian Solar Inc. without prior notice. Canadian Solar Inc. makes no warranty of any kind whatsoever, either explicitly or implicitly, with respect to the information contained herein.

1.2 LIMITATION OF LIABILITY

Canadian Solar Inc. shall not be held responsible for damages of any kind, including without limitation bodily harm, injury and property damage, relating to module handling, system installation, or compliance or non-compliance with the instructions set forth in this manual.

2.0 SAFETY PRECAUTIONS

Warning: All instructions should be read and understood before attempting to install, wire, operate and/or maintain the module. Module interconnects pass direct current (DC) when exposed to sunlight or other light sources. Contact with electrically active parts of the module, such as terminals, can result in injury or death, whether the module is connected or disconnected.

General Safety

- All installations must be performed in compliance with all applicable regional and local codes or other national or international electrical standards.
- Wear suitable protection (non-slip gloves, clothes, etc.) to prevent direct contact with 30VDC or greater, and to protect your hands from sharp edges during the installation.
- Use electrical insulated tools to reduce the risk of electric shock.
- Remove all metallic jewelry prior to installation to reduce the chance of accidental exposure to live circuits.
- Cover the front of the modules in the PV array with an opaque material to halt production of electricity when installing or working with a module or wiring.
- Do not install or handle the modules when they are wet or during periods of high wind.
- Do not use or install broken modules.
- If the front glass is broken, or the back sheet is torn, contact with any module surface or the frame can cause electric shock.
- There're no serviceable parts within the PV module. Do not attempt to repair any part of the module.
- Keep the junction box cover closed at all times.
- Do not disassemble a module or remove any module part.
- Do not artificially concentrate sunlight on a module.
- Do not connect or disconnect modules when current from the modules or an external source is present.

3.0 MECHANICAL / ELECTRICAL SPECIFICATIONS

The module electrical ratings are measured under Standard Test Conditions (STC) of 1 kW/m^2 irradiance with an AM1.5 spectrum, and cell temperature of 25℃. The detailed electrical and mechanical characteristics of Canadian Solar Inc. crystalline silicon PV modules can be found in table 3 of this manual (see Annex). Main electrical characteristics at STC also appear on each module label. The maximum system voltage for all module series is 1000 V.

Under certain conditions, a module may produce more current or voltage than its Standard Test Conditions rated power. Accordingly, when determining component ratings and capacities, the module short-circuit current at STC should be multiplied by 1.25, and a correction factor should be applied for the open-circuit voltage (see Table 1 below). An additional 1.25 multiplier for the short-circuit current (for a total of 1.56) for sizing conductors and fuses may be applicable, depending on your local regulations.

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Table 1: Low temperature correction factors table for open-circuit voltage

Lowest Expected Ambient Temperature (℃/℉)	Correction Factor
24 to 20/76 to 68	1.02
19 to 15/67 to 59	1.04
14 to 10/58 to 50	1.06
9 to 5/49 to 41	1.08
4 to 0/40 to 32	1.10
-1 to-5/31 to 23	1.12
-6 to-10/22 to 14	1.14
-11 to-15/13 to 5	1.16
-16 to-20/4 to-4	1.18
-21 to-25/-5 to-13	1.20
-26 to-30/-14 to-22	1.21
-31 to-35/-23 to-31	1.23
-36 to-40/-32 to-40	1.25

Alternatively, a more accurate correction factor for the open-circuit voltage can be calculated based on the following formula:

$C_{Voc}=1-\alpha_{Voc}\times(25-T)$

T is the lowest expected ambient temperature at the system location
α_{Voc} (%/℃) is the temperature coefficient of the selected module (Refer to corresponding datasheet)

3.1 DIODES

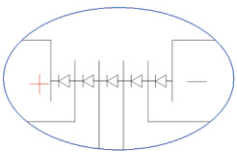
• Diodes inside the junction box should meet requirements below:

Table 2: By-pass diode specifications

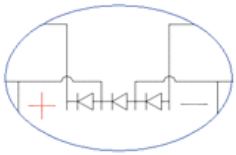
Module series	Number of bypass diodes	Number of cells by diodes	Diode ratings		Diode type
			Voltage	Current	
CS6P-PE	5	12	⩾40V	⩾12 A	Schottky diodes
CS6A-PE	5	10 (for 3 substrings) 9 (for 2 substrings)			
CS5P	4	24		⩾10A	
CS5A	3	24			
CS5T		20			
CS6A		16		⩾15 A	
CS6P		20			
CS6X		24			
CS6H	2	18		⩾10A	
CS5C		18			
CS6E		18			
CS6D		18			
CS6C		18			
CS5E		18			
CS5H		18			

• Diode configurations as below:

CS6P-PE /CS6A-PE

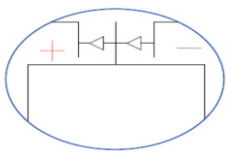


CS5A/CS5T/CS6A/CS6P/CS6X



CS5P

CS6H/CS5C/CS6E/CS6D/ CS6C/CS5E/CS5H



4.0 UNPACKING AND STORAGE

Precautions and General Safety

- Store modules in a dry and ventilated room.
- Do not allow children and unauthorized persons near the installation site or storage area of modules.
- Do not transport modules in an upright position.
- Unpacking module pallet with care and follow the unpacking steps marked on the pallet. Be careful when unpacking, transporting and storing the modules.
- Do not carry a module by its wires or junction box. Carry a module by its frame with two or more people.
- Do not place modules on top of each other.
- Do not place excessive loads on the module or twist the module frame.
- Do not stand, step, walk and/or jump on the module.
- Do not drop or place objects on the modules (such as tools.)
- Do not mark the modules with sharp instrument. Particular attention should be taken to avoid module backsheet to come in contact with sharp objects, as scratches may directly affect product safety.
- Do not leave a module unsupported or unsecured.
- Do not change the wiring of bypass diodes.
- Keep all electrical contacts clean and dry.

Product identification

- Each module is fitted with two identical barcodes (one on the laminate under the glass, the second on the module frame) for its unique identification. Each module has a unique serial number with 13 digits.
- A nameplate is also affixed on the rear side of each module. This nameplate defines the model type, as well as the main electrical and safety characteristics of the module.

5.0 MODULE INSTALLATION

Precautions and General Safety

- Before installing modules, contact the appropriate authorities for site, installation and inspection permission and requirement. .
- Check applicable building codes to ensure that the construction or structure (roof, facade, support, etc.) can withstand the module system load.
- When installing modules, please ensure the assembly is mounted over a fire resistant roof covering rated for the application. Canadian Solar modules have been listed as Class C according to UL790 standard.
- CS-series solar modules have been qualified for Application Class A (equivalent to Safety Class II requirements). Modules rated under this class should be used in systems operating at voltage above 50V or power above 240W, where general contact access is anticipated.

- CAUTION: In any case DO NOT STAND OR STEP on the modules, as localized high loads may induce severe micro-cracks at the cell level, which in turn may compromise module reliability. Failure to comply with above caution will void Canadian Solar Inc warranty.

Environmental conditions

- The module is intended for use in general open climates, as defined in IEC 60721-2-1: Classification of environmental conditions Part 2-1: Environmental conditions appearing in nature - temperature and humidity.
- Do not install modules near naked flames or flammable materials.
- Do not expose modules to artificially concentrated light sources.
- Do not immerse modules in water or constantly expose modules to water (either fresh or salt) (i.e. from fountains, sea spray).
- Exposing modules to salt (i.e. marine environments) and sulfur (i.e. sulfur sources, volcanoes) risks module corrosion.

Requirements of installation

- Ensure that the module meets the technical requirements of the system as a whole.
- Ensure that other systems components do not exert damaging mechanical or electrical influences on the modules.
- Modules can be wired in a series to increase voltage or in parallel to increase current. To connect in series, connect cables from the positive terminal of one module to the negative terminal of the next module. To connect in parallel, connect cables from the positive terminal of one module to the positive terminal on the next module.
- Quantity of bypass diodes provided can vary depending on model series.

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- Connect the quantity of modules that match the voltage specifications of the inverters used in the system. Modules must not be connected together to create a voltage higher than the permitted maximum system voltage, even under the worst local temperature conditions (see table 1 for correction coefficients to apply for open-circuit voltage).
- A maximum of two strings can be connected in parallel without using over-current protection device (fuses) incorporated in series within each string. Three of more strings can be connected in parallel if an appropriate and certified over-current protection device is installed in series with each string.
- Similar electrical performance modules should be connected in same series to avoid or minimize mismatch effects in arrays.
- To minimize risk in the event of an indirect lightning strike, avoid forming loops when designing the system.
- The recommended maximum series fuse rating is tabulated in annex.
- Modules should be firmly fixed in place in a manner suitable to withstand all expected loads, including wind and snow loads. A minimum clearance of 6.5 mm (1/4 of an inch) or more between modules is required to allow for thermal expansion of the frames.
- Small openings for water draining on the underside of the module should not be blocked after mounting.

Optimum orientation and tilt

- Find out the optimum orientation and tilt of the PV modules for your region to achieve the maximum annual yield. Generation of maximum power occurs when sunlight shines perpendicularly onto the PV modules.

Avoid shading

- Even the slightest partial shading (e.g., from dirt deposits) will cause a reduction in yield. A module is considered "shadow-free" if it is unobstructed across its entire surface for the whole year. Even on the shortest day of the year, unobstructed sunlight can reach the module.

Reliable ventilation

- Sufficient clearance (at least 10 cm) between the module frame and the mounting surface is required to allow for cooling air to circulate around the back of the module. This also allows for condensation or moisture to dissipate.

5.1 MODULE WIRING

Correct wiring scheme

- When designing the system, avoid forming loops (to minimize risk in the event of an indirect lighting strike). Make sure that wiring is correct before starting up the system. If the measured open circuit voltage (Voc) and short-circuit current (Isc) differ from the specifications, then there is a wiring fault.

Correct connection of plug connectors

- Make sure that the connection is safe and tight. The plug connector should not receive outer stress. The connector should only be used to connect the circuit. It should never be used to turn the circuit on and off.

Use of suitable materials

- Use special solar cable and suitable plugs only (wiring should be placed in conduit that is sunlight-resistant or, if exposed, should be sunlight-resistant) in accordance with local fire, building and electrical code. Ensure that they are in perfect electrical and mechanical condition.
- The permitted type of solar cable is single conductor, 2.5-10 mm^2 (8-14 AWG), 90℃ wet rated, with proper insulation to withstand the maximum possible system open-circuit voltage (such as TUV 2PfG1169 approved). The conductor material should be copper only. Select a suitable conductor gauge to minimize voltage drop.

Cable protection

- Secure the cables to the mounting system using UV-resistant cable ties. Protect exposed cables from damage with appropriate precautions (e.g. locate them within plastic conduit). Avoid exposure to the direct sunlight.

5.2 GROUNDING

- Although the modules are certified to safety class II, it is recommended that they be grounded and the module installation complies with all local electrical codes and regulations.
- The earth grounding connection should be made by a qualified electrician.
- Connect module frames to each other using adequate grounding cables, the recommended size is 4-14mm^2 (AWG 6-12) copper wires. Holes provided for this purpose are identified with a green label. All the junctions on the conductive connection must be fixed.
- The bolts, nuts, flat washers, lock washers or other relevant hardware should be made of stainless steel.

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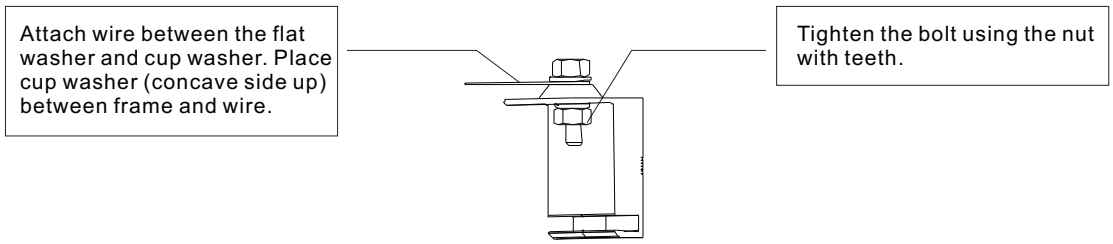
- Grounding hardware is not provided by Canadian Solar Inc.
- Two specific grounding methods are recommended for Canadian Solar Inc. standard modules with 5 mm grounding holes, as described below. Other grounding methods can be acceptable, provided they comply with all local electrical codes and regulations. For some modules (SunTuile or NewEdge), standard grounding methods cannot be applied, please refer to the most updated relevant technical notes (IM/IEC/SUNT-EN and IM/IEC/NEWE-EN).

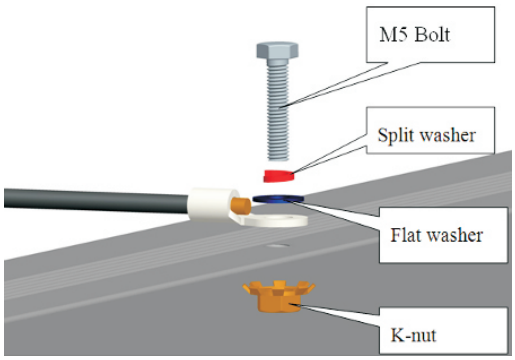
Method A: Bolt + Nut with teeth + Cup washer.


Attach wire between the flat washer and cup washer. Place cup washer (concave side up) between frame and wire.
Tighten the bolt using the nut with teeth.

- A grounding kit with M5 size SS cap bolt, M5 size SS flat washer, M5 size SS cup washer, and M5 size SS nut (with teeth) is used to attach a copper grounding wire to grounding hole pre-drilled on the frame (see picture above).
- Attach the wire between the flat washer and the cup washer. Ensure the cup washer is between the frame and wire with concave side up to prevent corrosion due to dissimilar metal. Tighten the bolt securely using the SS nut with teeth. A wrench may be used in this application. The tightening torque is 1 Nm.

Method B: Bolt + K-nut + Ring terminal (copper).

- Connect the grounding hardware (M5) to the grounding hole on the frame as shown in the picture.
- A K-nut is used to penetrate the frame's anodizing (protective coating) to create conductive connection.
- A torque moment of about 3 Nm should be used to fasten the grounding parts to module frame.

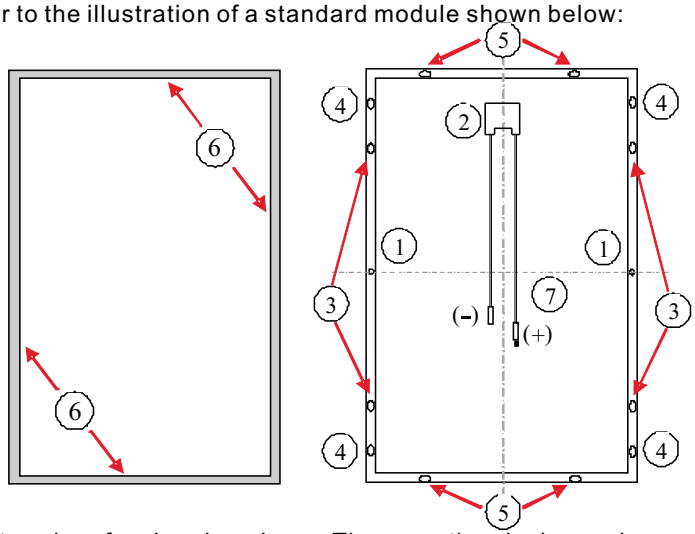


6.0 MOUNTING INSTRUCTIONS

Standard modules

- For a clear understanding of module, please refer to the illustration of a standard module shown below:

Reference	Designation
1	Grounding holes
2	Junction box
3	Standard mounting holes (long side)
4	Additional mounting holes (high wind or snow loads)
5	Standard mounting holes (short side)
6	Module frame
7	Cables and connectors



- The mounting design must be certified by a registered professional engineer. The mounting design and procedures shall comply with local codes and all authorities having jurisdiction.
- Mounting hardware is not provided by Canadian Solar Inc.
- Standard modules can be mounted to a support structure with several approved methods, either using the mounting holes located on the frame back flanges (see Example A), by means of clamps (see Example B) or by means of insertion systems. For other installation hardware, please contact your local representative for further information. Failure to use a recognized installation method will void Canadian Solar Inc warranty.

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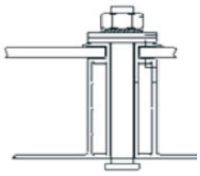
Example A:
Bolting

Example B:
Clamping on



- Use appropriate corrosion-proof fastening materials. All mounting hardware (bolt/spring washer/flat washer/nut) should be stainless steel M6 size for bolting method (A), and M8 size for clamping method (B).
- Use a torque wrench for installation. The above figure shows methods of fastening module to support structure. Tightening torques should respectively be within 4~6 Nm and 10~17 Nm for M6x1 (Example A) and M8x1.5 (Example B) coarse thread bolts, depending on bolt class. Different recommendations from specific clamping hardware suppliers should prevail.
- Standard modules can be installed in either landscape or portrait position, refer to the detailed instructions in tables 3 to 6 for further guidance. Note that further countermeasures such the use of additional support bars should be considered in heavy snow areas (> 2400 Pa), to avoid damage by the snow accumulating in the lowest row of modules.
- When the addition of a support bar is recommended to enhance mechanical stability and module long term performance reliability, material of suitable resistance should be selected. Canadian Solar Inc recommends a minimum thickness of 50mm for the bar. The support bar centerline should be positioned within 100 mm of the side frame centerline (slight shift may be necessary to access module grounding hole).

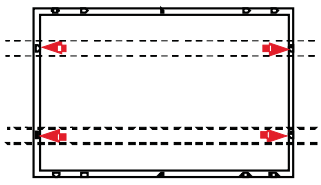
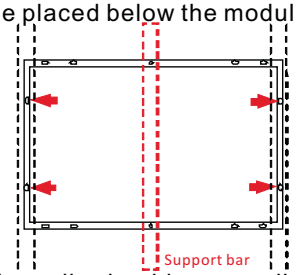
6.1 METHOD A: BOLTING

- Modules should be bolted to support structures through mounting holes located in the frame's back flanges only. Do not drill additional holes or modify the module frame. Doing so will void the warranty.
- Each module must be securely fastened at a minimum of 4 points on two opposite sides, using the most inner mounting holes. If additional wind loads are anticipated for this installation, additional mounting points should be used. System designer and installer are responsible for load calculations and for proper design of support structure.
- Modules should be bolted at the following hole locations depending on the configuration and load:

Table 3: Authorized attachments for bolting method

<table>
<tr><th></th><th>Uplift load ⩽ 2400 Pa
Downforce load ⩽ 2400 Pa</th><th>Uplift load ⩽ 2400 Pa
2400 Pa ⩽ Downforce load ⩽ 5400 Pa</th></tr>
<tr><td>Bolting on long side frame</td><td colspan="2">Use 4 standard mounting holes (long side)

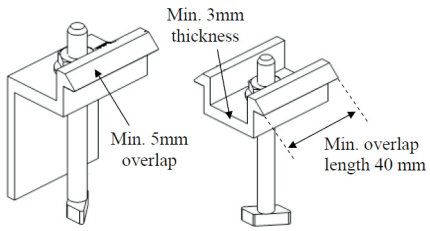
Mounting rails may run perpendicularly or parallel to the long side frame</td></tr>
<tr><td>Bolting on short side frame

(except for 6X series)</td><td>Use 4 standard mounting holes (short side)
 
Mounting rails may run parallel or perpendicularly to the short side frame</td><td>Use 4 standard mounting holes (short side).
An additional support bar should be placed below the module.
 
Mounting rails should run parallel to the short side frame</td></tr>
</table>

6.2 METHOD B: CLAMPING

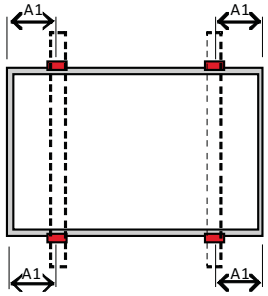
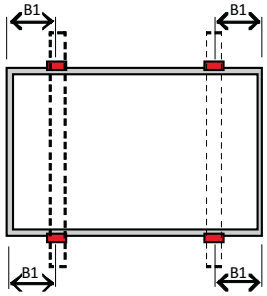
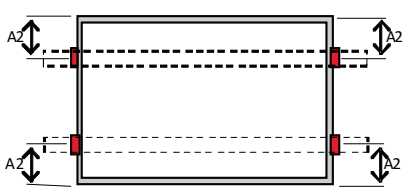
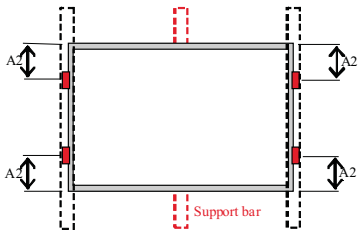
- The mounting method has been qualified by Canadian Solar Inc but has NOT yet been certified by a third-party organization.
- Top or bottom clamping methods will vary and are dependent on the mounting structures. Follow mounting guidelines recommended by the mounting system supplier.
- Each module must be securely fastened at a minimum of 4 points on two opposite sides. The clamps should be positioned according to the authorized position ranges defined in table 4. Install and tighten the module clamps to the mounting rails using the torque stated by the mounting hardware manufacturer. System designer and installer are responsible for load calculations and for proper design of support structure.
- Canadian Solar Inc. warranty may be void in cases where improper clamps or unsuitable installation methods are found. When installing inter-modules or end type clamps, take measures so as:

1. Not to bend the module frame
2. Not to touch or cast shadow on the front glass
3. Not to damage the surface of the frame
4. To ensure the clamps overlap the module frame by at least 5 mm.
5. To ensure the clamps overlap length is at least 40 mm.



- Clamp material should be anodized aluminum alloy. Floating type clamps are not authorized.
- Clamp positions are of crucial importance for the reliability of the installation, the clamp centerlines must only be positioned within the ranges indicated in table 4, depending on the configuration and load.
- For configurations where the mounting rails run parallel to the clamps installation side, precautions should be taken to ensure the module frame (C-shape) overlap the rail by 15mm or more.

Table 4: Authorized attachments for clamping method

	Uplift load ⩽ 2400 Pa **Downforce load ⩽ 2400 Pa**	**Uplift load ⩽ 2400 Pa** **2400 Pa ⩽ Downforce load ⩽ 5400 Pa**
Clamping on long side frame	Use 4 clamps on the long side, the allowed range depends on the module type.  Mounting rails may run perpendicularly or parallel to the long side frame	Use 4 clamps on the long side, the allowed range depends on the module type.  Mounting rails may run perpendicularly or parallel to the long side frame
Clamping on short side frame	Use 4 clamps on the short side, the allowed range depends on the module type. Mounting rails may run parallel or perpendicularly to the short side frame  	Use 4 clamps on the short side, the allowed range depends on the module type. An additional support bar should be placed below the module.  Mounting rails should run parallel to the short side frame

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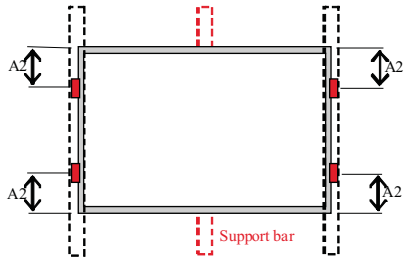
Clamping on short side frame	For CS5P and CS6P series, an additional support bar should be placed below the module where download force above 1600Pa is expected. Mounting rails should run parallel to the short side frame. 	

Authorized range for clamping as a function of model type:

Model type	A1 range (mm)	B1 range (mm)	A2 range (mm)
CS5A	220 - 380	330 - 400	170 - 200
CS5P	220 - 390	330 - 400	220 - 270
CS6A	220 - 340	270 - 330	200 - 250
CS6P, CS5T	240 - 410	340 - 410	200 - 250
CS6X	340 - 550	410 - 490	200 - 250

6.3 METHOD C: INSERTION SYSTEMS

- The mounting method has been qualified by Canadian Solar Inc but has NOT yet been certified by a third-party organization.
- Insertion methods will vary and are dependent on the mounting structures. Follow mounting guidelines recommended by the mounting system supplier.
- Each module must be securely maintained through all its length on two opposite sides. Install and tighten the insertion profiles to the support structure using the hardware and instructions provided by the mounting system manufacturer. System designer and installer are responsible for load calculations and for proper design of support structure.
- Canadian Solar Inc. warranty may be void in cases where improper insertion systems or unsuitable installation methods are found. When installing insertion profiles, take measures so as:

1. Not to bend the module frame
2. Not to touch or cast shadow on the front glass
3. Not to damage the surface of the frame
4. To ensure the insertion profiles overlap the module frame by at least 10 mm.
5. To ensure the module frame (C-shape) overlap the insertion profiles by at least 15mm.
6. To ensure insertion profile thickness and tolerances suits module thickness (40mm for most of Canadian Solar inc modules).

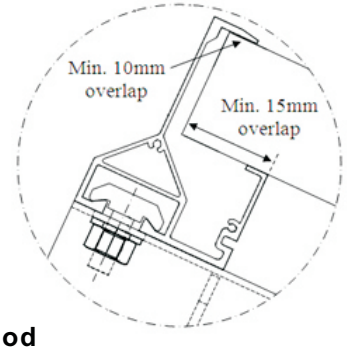
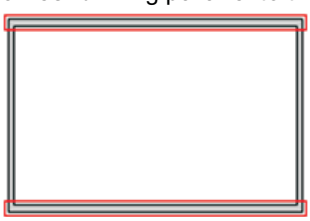
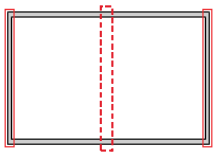
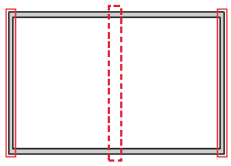


Table 5: Authorized attachments for insertion method

	Uplift load ⩽ 2400 Pa Downforce load ⩽ 2400 Pa	**Uplift load ⩽ 2400 Pa 2400 Pa ⩽ Downforce load ⩽ 4000 Pa**
Insertion profile on long side frame	Use 2 insertion profiles running parallel to the long side frame.  For CS6X series, installations where the downforce load can reach up to a 5400Pa are authorized.	

Insertion profile on short side frame	Use 2 insertion profiles running parallel to the short side frame. For CS5P and CS6P series, an additional support bar should be placed below the module where download force above 1600Pa is expected. 	Use 2 insertion profiles running parallel to the short side frame.  An additional support bar should be placed below the module. For CS6X series, installations where the downforce load can reach up to a 5400Pa are authorized

6.4 SPECIFIC MODULE RANGES

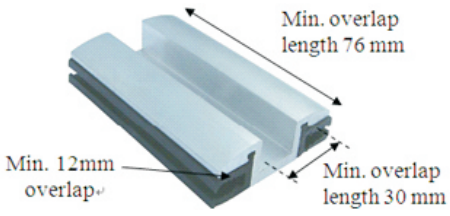
Technical notes

- For SunTuile module frames (SunTuile series: CS5A-xxxMF and CS6A-xxxPF models), please refer to the most updated IM/IEC/ SUNT-EN technical note.
- For NewEdge module frames (NewEdge series: CS5A-xxxMX and CS6P-xxxPX models), please refer to the most updated IM/IEC/ NEWE-EN technical note.
- For frameless laminates (CS5A-xxxM-L model) mounted with Intrasole CL, please refer to the most updated IM/IEC/INTCL-EN technical note.

Floating clamped configuration (only for CS5A-M-L laminate model)

- Clamping methods will vary and are dependent on the mounting structures. Follow mounting guidelines recommended by the mounting system supplier.
- Each laminate must be securely fastened at a minimum of 8 points on the two opposite long sides. Clamp positions are of crucial importance for the reliability of the installation, the clamp centerlines must only be positioned within the ranges indicated in table 6. Install and tighten the module clamps to the mounting rails using the torque stated by the mounting hardware manufacturer (in the absence of instructions, Canadian Solar Inc recommends a torque about 15Nm to 20Nm). System designer and installer are responsible for load calculations and for proper design of support structure.
- Clamp material should be aluminum. EPDM type rubber or similar material should be used between the laminate/clamp and laminate/mounting rail interfaces in order to prevent any damages to the laminate.
- Canadian Solar Inc. warranty may be void in cases where improper clamps or unsuitable installation methods are found. When installing inter-modules or end type clamps, take measures so as:

1. Not to bend the laminate excessively
2. Not to cast shadow on the cells
3. Not to damage or scratch the surface of the glass and backsheet
4. To ensure the clamps overlap the module glass by at least 12 mm.
5. To ensure the clamps overlap length is at least 76 mm.
6. To ensure a minimum contact area of 40mm x 30mm between the clamp and the mounting rails (rail thickness should be at leat 40mm).
7. To use clamps of appropriate thickness, allowing the CS5A-M-L 4mm glass laminate to be fixed floatingly.



- Vertical (landscape) mounting of the laminate is not authorized unless appropriate safety hooks are used to secure the laminate against sliding-off.

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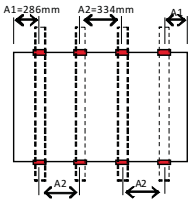
Table 6: Authorized attachments for CS5A-M-L laminate

	Uplift load ⩽ 2400 Pa Downforce load ⩽ 2400 Pa	Uplift load ⩽ 2400 Pa 2400 Pa ⩽ Downforce load ⩽ 5400 Pa
Clamping on long side frame	Use 4 clamps on the long side, at the positions defined below (tolerance ±20 mm).  Mounting rails may run perpendicularly or parallel to the long side frame	Not allowed.
Clamping on short side frame	Not allowed	

7.0 MAINTENANCE

- Do not change the PV components (diode, junction box, plug connectors).
- Regular maintenance is required to keep modules clear of snow, bird droppings, seeds, pollen, leaves, branches, dirt spots and dust.
- If a module has a sufficient tilt (at least 15^0), it generally is not necessary to clean the modules (rainfall will have a self-cleaning effect). When there is a noticeable buildup of soiling deposits on the module surface, wash the PV array with water and a gentle cleaning implement (a sponge) during the cool part of the day. Dirt must never be scraped or rubbed away when dry, as this will cause micro-scratches.
- If snow is present, a brush with soft bristles can be used to clean the surface of the module.
- Periodically inspect the system to make sure all wiring and supports stay intact.
- If you need electrical or mechanical inspection or maintenance, it is recommended to have a licensed, authorized professional carry out the job to avoid hazards of electric shock or injury.

ANNEX: MECHANICAL AND ELECTRICAL RATINGS

Standard Test Conditions are: irradiance of 1 kW/m^2, AM1.5 spectrum, and cell temperature of 25℃. The electrical characteristics are respectively within±10 percent or [0; +5W] of the indicated values for Isc, Voc and Pmax. Specifications are subject to change without notice.

Table 7: Specifications for CS-series photovoltaic modules under STC

Model Type	Maximum power Pmax<W>	Operating Voltage (Vmp) <V>	Operating current Imp <A>	Open Circuit Voltage Voc <V>	Short Circuit Current Isc <A>	Max. Series Fuse Rating <A>	Overall Dimension <mm>	Weight <Kg>
CS5E-20P	20	17.4	1.15	21.7	1.25	3.00	620×284×25	2.10
CS5E-22P	22	17.7	1.24	22	1.33	3.00		
CS5E-24P	24	18.20	1.32	22.19	1.43	3.00		
CS5C-85M	85	17.8	4.78	22.1	5.12	10.00	1213×547×40	8.00
CS5C-90M	90	18	4.99	22.3	5.34	10.00		
CS5C-95M	95	18.3	5.19	22.4	5.52	10.00		
CS5C-100M	100	18.5	5.39	22.5	5.74	10.00		
CS5E-20M	20	17.6	1.14	21.9	1.23	3.00	620×284×25	2.10
CS5E-22M	22	17.9	1.23	22.2	1.31	3.00		
CS5E-24M	24	18.4	1.31	22.4	1.41	3.00		
CS5E-25M	25	18.7	1.34	22.6	1.43	3.00		
CS5F-13M	13	17.4	0.75	21.5	0.83	3.00	446×284×25	1.50
CS5F-14M	14	17.5	0.8	21.8	0.88	3.00		
CS5F-15M	15	17.8	0.84	22	0.92	3.00		

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Model Type	Maximum power Pmax<W>	Operating Voltage (Vmp) <V>	Operating current Imp <A>	Open Circuit Voltage Voc <V>	Short Circuit Current Isc <A>	Max. Series Fuse Rating <A>	Overall Dimension <mm>	Weight <Kg>
CS5H-43M	43	17.8	2.41	22.2	2.57	5.00	630x542x25	3.5
CS5H-45M	45	18	2.5	22.3	2.67	5.00		
CS5H-47M	47	18.3	2.57	22.4	2.75	5.00		
CS5H-50M	50	18.7	2.68	22.6	2.86	5.00		
CS5A-165P	165	34.9	4.73	43.7	5.09	10.00	1595X801X40 or 1580 X808X40	15.30
CS5A-170P	170	35.2	4.83	43.9	5.20	10.00		
CS5A-175P	175	35.4	4.94	44.1	5.31	10.00		
CS5A-180P	180	35.7	5.04	44.2	5.41	10.00		
CS5A-185P	185	36.0	5.14	44.3	5.54	10.00		
CS5A-190P	190	36.2	5.25	44.4	5.61	10.00		
CS5A-195P	195	36.6	5.32	44.6	5.70	10.00		
CS5A-155M/MF/MX/M-L	155.0	35.1	4.42	43.6	4.80	10.00	1595X801X40 (standard Ed1) or 1580 X808X40 (standard Ed2) or 1639X827X17 (MF only) or 1589X795X22.5 (M-L only)	15.30 (standard) or 17.00 (MX only)
CS5A-160M/MF/MX/M-L	160.0	35.1	4.55	43.8	4.91	10.00		
CS5A-165M/MF/MX/M-L	165.0	35.3	4.68	44.1	5.01	10.00		
CS5A-170M/MF/MX/M-L	170.0	35.6	4.78	44.3	5.12	10.00		
CS5A-175M/MF/MX/M-L	175.0	35.8	4.89	44.4	5.23	10.00		
CS5A-180M/MF/MX/M-L	180.0	36.1	4.99	44.6	5.34	10.00		
CS5A-185M/MF/MX/M-L	185.0	36.4	5.09	44.6	5.46	10.00		
CS5A-187.5MF	187.5	36.5	5.14	44.7	5.49	10.00		
CS5A-190M/MF/MX/M-L	190.0	36.6	5.19	44.8	5.52	10.00		
CS5A-195M/MF/MX/M-L	195.0	37.0	5.27	45.0	5.62	10.00		
CS5A-200M/MF/MX/M-L	200.0	37.4	5.35	45.3	5.71	10.00		
CS5A-205M	205.0	37.7	5.43	45.4	5.81	10.00		
CS5P-215P	215.0	46.4	4.64	57.9	4.99	10.00	1602X1061X40	20.30
CS5P-220P	220.0	46.6	4.73	58.3	5.05	10.00		
CS5P-225P	225.0	46.9	4.79	58.6	5.13	10.00		
CS5P-230P	230.0	47.0	4.89	58.7	5.22	10.00		
CS5P-235P	235.0	47.2	4.98	58.8	5.31	10.00		
CS5P-240P	240.0	47.6	5.04	58.9	5.38	10.00		
CS5P-245P	245.0	47.9	5.11	59.0	5.47	10.00		
CS5P-250P	250.0	48.2	5.19	59.1	5.53	10.00		
CS5P-255P	255.0	48.5	5.26	59.3	5.58	10.00		
CS5P-260P	260.0	48.9	5.32	59.5	5.63	10.00		
CS5P-200M	200.0	46.7	4.29	57.8	4.69	10.00	1602X1061X40	20.30
CS5P-205M	205.0	46.7	4.39	58.0	4.77	10.00		
CS5P-210M	210.0	46.8	4.49	58.2	4.86	10.00		
CS5P-215M	215.0	46.8	4.59	58.4	4.95	10.00		
CS5P-220M	220.0	47.0	4.68	58.8	5.01	10.00		
CS5P-225M	225.0	47.4	4.74	59.0	5.09	10.00		
CS5P-230M	230.0	47.5	4.84	59.1	5.18	10.00		
CS5P-235M	235.0	47.7	4.93	59.2	5.27	10.00		
CS5P-240M	240.0	48.1	4.99	59.4	5.34	10.00		
CS5P-245M	245.0	48.4	5.06	59.5	5.43	10.00		
CS5P-250M	250.0	48.7	5.14	59.6	5.49	10.00		
CS5P-255M	255.0	49.0	5.21	59.8	5.55	10.00		
CS5P-260M	260.0	49.3	5.27	60.0	5.62	10.00		
CS5T-130M	130.0	29.2	4.45	36.3	4.82	10.00	1638X982X40	19.00
CS5T-135M	135.0	29.3	4.60	36.6	4.95	10.00		
CS5T-140M	140.0	29.5	4.74	36.8	5.08	10.00		
CS5T-145M	145.0	29.8	4.87	37.0	5.21	10.00		
CS5T-150M	150.0	30.1	4.99	37.1	5.34	10.00		
CS6H-26M	26	18.4	1.41	22.7	1.5	3.00	534X350X25	2.40
CS6H-24M	24	18.1	1.33	22.4	1.41	3.00		
CS6H-22M	22	17.7	1.24	22.1	1.33	3.00		
CS6H-20M	20	17.5	1.14	21.9	1.26	3.00		

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CS6H-26P	26	18.2	1.43	22.5	1.52	3.00	534X350X25	2.40
CS6H-24P	24	17.9	1.34	22.2	1.43	3.00		
CS6H-22P	22	17.5	1.25	21.9	1.35	3.00		
CS6H-20P	20	17.3	1.16	21.7	1.28	3.00		
CS6D-60P	60	17.3	3.47	21.7	3.84	10.00	783X666X35	6.50
CS6D-65P	65	17.5	3.72	21.9	4.02	10.00		
CS6D-70P	70	17.8	3.93	22.1	4.21	10.00		
CS6D-75P	75	18.1	4.15	22.3	4.43	10.00		
CS6D-60M	60	17.5	3.43	21.9	3.78	10.00	783X666X35	6.50
CS6D-65M	65	17.6	3.68	22.1	3.96	10.00		
CS6D-70M	70	18.0	3.89	22.3	4.15	10.00		
CS6D-75M	75	18.3	4.11	22.5	4.37	10.00		
CS6E-60M	60	18.6	3.23	22.8	3.42	5.00	608X666X35	5.10
CS6E-55M	55	18.2	3.03	22.4	3.22	5.00		
CS6E-50M	50	17.8	2.82	22.2	3.0	5.00		
CS6E-45M	45	17.5	2.57	21.9	2.83	5.00		
CS6E-60P	60	18.4	3.26	22.6	3.47	5.00	608X666X35	5.10
CS6E-55P	55	18.0	3.06	22.2	3.27	5.00		
CS6E-50P	50	17.6	2.84	22.0	3.27	5.00		
CS6E-45P	45	17.3	2.6	21.7	2.88	5.00		
CS6C-120M	120.0	17.5	6.86	21.9	7.56	15.00	1485X666X40	12.00
CS6C-125M	125.0	17.6	7.12	22.0	7.71	15.00		
CS6C-130M	130.0	17.6	7.38	22.1	7.95	15.00		
CS6C-135M	135.0	17.8	7.58	22.2	8.07	15.00		
CS6C-140M	140.0	18.0	7.76	22.3	8.28	15.00		
CS6C-145M	145.0	18.1	8.01	22.4	8.52	15.00		
CS6C-120P	120.0	17.3	6.93	21.7	7.67	15.00	1485X666X40	12.00
CS6C-125P	125.0	17.4	7.19	21.8	7.83	15.00		
CS6C-130P	130.0	17.4	7.46	21.9	8.07	15.00		
CS6C-135P	135.0	17.6	7.65	22.0	8.19	15.00		
CS6C-140P	140.0	17.9	7.84	22.1	8.40	15.00		
CS6C-145P	145.0	17.9	8.09	22.2	8.65	15.00		
CS6P-200M	200.0	29.2	6.86	36.5	7.56	15.00	1638X982X40	19.00 (Standard) or 19.50 (MM Only)
CS6P-205M	205.0	29.2	7.02	36.5	7.66	15.00		
CS6P-210M	210.0	29.3	7.17	36.7	7.77	15.00		
CS6P-215M	215.0	29.3	7.33	36.8	7.89	15.00		
CS6P-220M	220.0	29.5	7.45	36.9	7.97	15.00		
CS6P-225M/MM	225.0	29.7	7.58	37.0	8.07	15.00		
CS6P-230M/MM	230.0	29.9	7.70	37.1	8.22	15.00		
CS6P-235M/MM	235.0	30.1	7.82	37.2	8.34	15.00		
CS6P-240M/MM	240.0	30.2	7.95	37.3	8.46	15.00		
CS6P-245M/MM	245.0	30.3	8.09	37.4	8.61	15.00		
CS6P-250M/MM	250.0	30.4	8.22	37.5	8.74	15.00		
CS6P-255M/MM	255.0	30.5	8.35	37.7	8.87	15.00		
CS6P-260M/MM	260.0	30.7	8.48	37.8	8.99	15.00		
CS6P-265MM	265.0	30.9	8.61	37.9	9.11	15.00		
CS6P-270MM	270.0	31.1	8.67	38.2	9.19	15.00		
CS6P-165PE	165.0	27.7	5.96	35.6	6.73	15.00	1638X982X40	19.00 (standard) or 20.50 (PX only) or 19.50 (PM Only)
CS6P-170PE	170.0	28.0	6.07	35.7	6.85	15.00		
CS6P-175PE	175.0	28.2	6.21	35.8	7.00	15.00		
CS6P-180PE	180.0	28.2	6.38	35.8	7.16	15.00		
CS6P-185PE	185.0	28.5	6.49	35.9	7.27	15.00		
CS6P-190PE	190.0	28.6	6.64	36.0	7.42	15.00		
CS6P-195PE	195.0	28.7	6.80	36.1	7.54	15.00		
CS6P-200P/PE/PX	200.0	28.9	6.93	36.2	7.67	15.00		
CS6P-205P/PE/PX	205.0	28.9	7.09	36.2	7.78	15.00		

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CS6P-210P/PE/PX	210.0	29.0	7.25	36.4	7.89	15.00		
CS6P-215P/PE/PX	215.0	29.0	7.40	36.5	8.01	15.00		
CS6P-220P/PE/PM/PX	220.0	29.2	7.53	36.6	8.09	15.00		
CS6P-225P/PE/PM/PX	225.0	29.4	7.65	36.7	8.19	15.00		
CS6P-230P/PE/PM/PX	230.0	29.6	7.78	36.8	8.34	15.00		
CS6P-235P/PE/PM/PX	235.0	29.8	7.90	36.9	8.46	15.00		
CS6P-240P/PM/PX	240.0	29.9	8.03	37.0	8.59	15.00		
CS6P-245P/PM/PX	245.0	30.0	8.17	37.1	8.74	15.00		
CS6P-250P/PM/PX	250.0	30.1	8.30	37.2	8.87	15.00		
CS6P-255P/PM/PX	255.0	30.2	8.43	37.4	9.00	15.00		
CS6P-260P/PM/PX	260.0	30.4	8.56	37.5	9.12	15.00		
CS6P-265PM	265.0	30.6	8.66	37.7	9.23	15.00		
CS6P-270PM	270.0	30.8	8.75	37.9	9.32	15.00		
CS6P-275PM	275.0	31.0	8.88	38.0	9.45	15.00		
CS6A-160M	160.0	23.3	6.86	29.2	7.56	15.00	1324X982X40	15.30 (Standard) or 15.50 (MM Only)
CS6A-165M	165.0	23.4	7.06	29.2	7.71	15.00		
CS6A-170M	170.0	23.5	7.24	29.4	7.80	15.00		
CS6A-175M	175.0	23.6	7.41	29.5	7.92	15.00		
CS6A-180M	180.0	23.8	7.58	29.6	8.07	15.00		
CS6A-185M	185.0	23.9	7.74	29.7	8.26	15.00		
CS6A-190M/MM	190.0	24.1	7.87	29.8	8.38	15.00		
CS6A-195M/MM	195.0	24.2	8.04	29.9	8.56	15.00		
CS6A-200M/MM	200.0	24.3	8.22	30.0	8.74	15.00		
CS6A-205MM	205.0	24.5	8.38	30.2	8.90	15.00		
CS6A-210MM	210.0	24.6	8.54	30.3	9.06	15.00		
CS6A-215MM	215.0	24.7	8.70	30.4	9.22	15.00		
CS6A-135PE	135.0	22.3	6.05	28.5	6.82	15.00	1324X982X40 (standard) or 1368X1008X17 (PF only) or 1318X976X22.5 (P-L only)	15.30 (standard) or 18.50 (PF Only) or 15.50 (PM Only) or 15.00 (P-L only)
CS6A-140PE	140.0	22.5	6.21	28.6	7.00	15.00		
CS6A-145PE	145.0	22.7	6.41	28.7	7.19	15.00		
CS6A-150PE	150.0	22.9	6.56	28.8	7.35	15.00		
CS6A-155PE	155.0	22.9	6.76	28.8	7.51	15.00		
CS6A-160P/PE/PX	160.0	23.1	6.93	28.9	7.67	15.00		
CS6A-165P/PE/PF/PX/P-L	165.0	23.1	7.13	29.0	7.82	15.00		
CS6A-170P/PE/PF/PX/P-L	170.0	23.2	7.32	29.2	7.92	15.00		
CS6A-175P/PE/PF/PX/P-L	175.0	23.4	7.49	29.3	8.04	15.00		
CS6A-180P/PE/PF/PX/P-L	180.0	23.5	7.65	29.4	8.19	15.00		
CS6A-185P/PE/PF/PM/PX/P-L	185.0	23.7	7.82	29.4	8.39	15.00		
CS6A-190P/PE/PF/PM/PX/P-L	190.0	23.9	7.95	29.6	8.50	15.00		
CS6A-195P/PF/PM/PX/P-L	195.0	24.0	8.13	29.6	8.69	15.00		
CS6A-200P/PM/PX	200.0	24.1	8.30	29.8	8.87	15.00		
CS6A-205P/PM/PX	205.0	24.2	8.47	29.9	9.03	15.00		
CS6A-210P/PM/PX	210.0	24.3	8.63	30.0	9.19	15.00		
CS6A-215PM	215.0	24.5	8.78	30.2	9.35	15.00		
CS6X-255P	255.0	34.8	7.33	43.7	7.95	15.00	1954X982X40	27.00 (4mm Glass) or 23.00 (3.2mm Glass)
CS6X-260P	260.0	34.9	7.45	43.8	8.04	15.00		
CS6X-265P	265.0	35.1	7.55	43.9	8.10	15.00		
CS6X-270P	270.0	35.3	7.65	44.1	8.19	15.00		
CS6X-275P	275.0	35.5	7.76	44.1	8.31	15.00		
CS6X-280P	280.0	35.6	7.86	44.2	8.42	15.00		
CS6X-285P	285.0	35.8	7.96	44.3	8.53	15.00		
CS6X-290P	290.0	35.9	8.08	44.4	8.64	15.00		
CS6X-295P	295.0	36.0	8.19	44.5	8.76	15.00		
CS6X-300P	300.0	36.1	8.30	44.6	8.87	15.00		
CS6X-305P	305.0	36.3	8.41	44.8	8.97	15.00		

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Model Type	Maximum power Pmax<W>	Operating Voltage (Vmp) <V>	Operating current Imp <A>	Open Circuit Voltage Voc <V>	Short Circuit Current Isc <A>	Max. Series Fuse Rating <A>	Overall Dimension <mm>	Weight <Kg>
CS6X-255M	255.0	35.2	7.25	44.0	7.83	15.00	1954X982X40	27.00 (4mm Glass) or 23.00 (3.2mm Glass)
CS6X-260M	260.0	35.3	7.37	44.1	7.92	15.00		
CS6X-265M	265.0	35.5	7.47	44.3	7.98	15.00		
CS6X-270M	270.0	35.6	7.58	44.4	8.07	15.00		
CS6X-275M	275.0	35.8	7.68	44.5	8.19	15.00		
CS6X-280M	280.0	36.0	7.78	44.6	8.30	15.00		
CS6X-285M	285.0	36.1	7.89	44.7	8.40	15.00		
CS6X-290M	290.0	36.3	8.00	44.7	8.51	15.00		
CS6X-295M	295.0	36.4	8.11	44.9	8.63	15.00		
CS6X-300M	300.0	36.5	8.22	45.0	8.74	15.00		
CS6X-305M	305.0	36.6	8.33	45.2	8.84	15.00		
CS6X-310M	310.0	36.7	8.44	45.3	8.95	15.00		

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